

What is claimed is:

1. A method for forming a photoresist relief image, comprising:
  - (a) applying a photoresist composition on a substrate, the photoresist  
5 comprising an aromatic resin and a photoactive component, the resin obtainable from reaction of i) a polyol and/or thiol, and ii) and a reactive methylene or keto compound, at least one of the polyol and methylene compound having one or more electronegative substituents, and
  - (b) exposing the photoresist to activating radiation and developing the  
10 exposed photoresist layer.
2. The method of claim 1, wherein the resin comprises at least one electronegative group and the photoresist is exposed with radiation having a wavelength of less than about 300 nm.  
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3. The method of claim 2, wherein the photoresist is exposed with radiation having a wavelength of less than about 260 nm.
4. The method of claim 2, wherein the photoresist is exposed with  
20 radiation having a wavelength of less than about 200 nm.
5. The method of claim 2, wherein the photoresist is exposed with radiation having a wavelength of about 157 nm.
- 25 6. The method of any one of claims 1 through 5 wherein the resin comprises phenolic units.
7. The method of any one of claims 1 through 6 wherein the polyol is an aromatic compound.

8. The method of any one of claims 1 through 6 wherein the polyol is a bisphenol, a polyhydroxybenzene or a polycarboxylic acid compound.

5 9. The method of any one of claims 1 through 8 wherein the methylene compound or keto compound is a benzyl compound, or an aldehyde substituted with one or more electronegative groups.

10 10. The method of any one of claims 1 through 9 wherein the resin comprises halogen, halogenated lower alkyl, nitro, cyano, sulfinyl, O-C-O or sulfonyl groups.

15 11. The method of any one of claims 1 through 10 wherein the resin comprises at least one of fluorine atom, fluorinated lower alkyl, perfluoroalkyl, perfluoroalkylene, fluorinated cycloalkyl, and fluorinated ethers and esters including fluorinated cyclic ethers and esters.

20 12. The method of any one of claims 1 through 11 wherein the resin comprises acrylate units.

13. The method of any one of claims 1 through 11 wherein the resin is a homopolyacetal.

25 14. The method of any one of claims 1 through 12 wherein the resin is a copolyacetal.

15. The method of any one of claims 1 through 14 wherein the polymer is chemically amplified positive resist.

16. The method of any one of claims 1 through 14 wherein the polymer is a negative resist.

17. A photoresist composition comprising a photoactive component  
5 and a resin binder comprising a polymer that comprises repeat units of:

1) an active methylene or aldehyde or other carbonyl compound that forms an acetal group in a polymerization or co-polymerization reaction; and

2) a polyol or thiol that reacts with the methylene or aldehyde or other carbonyl compound to form the acetal group.

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16. The photoresist composition of claim 15 wherein repeat units of the polymer comprise one or more electronegative substituents.

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17. The photoresist of claim 16 wherein the electronegative group is one of halogen, halogenated lower alkyl, nitro, cyano, sulfinyl, O-C-O, or sulfonyl.

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18. The photoresist of claim 16 wherein the electronegative group is a fluorine atom, trifluoromethyl, difluoromethyl, monofluoromethyl, pentafluoroethyl, tetrafluoroethyl, trifluoroethyl, difluoroethyl, monofluoroethyl, trifluoromethoxy, difluoromethoxy, monofluoromethoxy, pentafluoroethoxy, tetrafluoroethoxy, trifluoroethoxy, difluoroethoxy, or a monofluoroethoxy group.

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19. The photoresist of claim 16 wherein the resin comprises at least one of fluorine atom or fluorinated alkyl.

20. The photoresist of any one of claims 15 through 19 wherein the resin is a homopolyacetal.

21. The photoresist of any one of claims 15 through 19 wherein the resin is a copolyacetal.

22. The photoresist of any one of claims 15 through 19 wherein the  
5 polymer is a co-polymer.

23. The photoresist of any one of claims 15 through 22 wherein the polymer comprises polymerized diphenolic, adamantyl dicarboxylic, or ethylene units.

24. The photoresist of any one of claims 15 through 23 wherein the resin comprises phenolic units.

25. The photoresist of any one of claims 15 through 24 wherein the  
15 polyol is an aromatic compound.

26. The photoresist of any one of claims 15 through 25 wherein the polyol is a bisphenol, a polyhydroxybenzene or a polycarboxylic acid compound.

27. The photoresist of any one of claims 15 through 26 wherein the methylene or aldehyde compound is a halobenzyl compound or an aldehyde substituted with one or more electronegative groups.

28. The photoresist of any one of claims 15 through 27 wherein the  
25 resin comprises acrylate units.

29. A method of forming a positive or negative photoresist relief image, comprising:

(a) applying a coating layer of a photoresist of any one of claims 15 through 27 on a substrate; and

5 (b) exposing and developing the photoresist layer to yield a relief image.

30. The method of claim 29 wherein the photoresist layer is exposed with radiation having a wavelength of less than about 300 nm.

10 31. The method of claim 29 wherein the photoresist layer is exposed with radiation having a wavelength of less than about 170 nm.

15 32. The method of claim 29 wherein the photoresist layer is exposed with radiation having a wavelength of about 157 nm.

33. An article of manufacture comprising a substrate having coated thereon a layer of the photoresist composition of any one of claims 15 through 27.

20 34. The article of claim 33 wherein the substrate is a microelectronic wafer or an optical-electronic device substrate.